

Convective Heating Predictions of Apollo IV Flight Data

It has been more than 50 years since NASA engineers have attempted to design a manned space vehicle with the capability to return from beyond low Earth orbit. In this interval, our methodologies for designing the thermal protection system (TPS) to protect humans from the extremely high temperatures of re-entry have changed significantly. With these considerations in mind, we return to the Apollo IV (AS-501) flight data. This incredible data set allows us to assess the current tools and methodologies being used to design Orion MPCV. In particular, our ability to predict the aftbody separated region convective heating environments for MPCV is critical. The design uses reusable TPS in this area, whereas Apollo designers used ablative TPS which can withstand much more severe environments. This presentation will revisit the flight data, summarize the assumptions going into the analysis, present the results and draw conclusions regarding how accurately we can currently predict the heating in the aftbody separated region of a re-entry capsule.